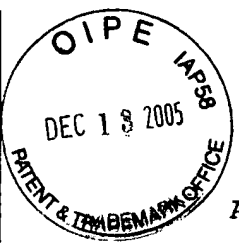APPLICATION NO.   09/826,118

TITLE OF INVENTION: Wavelet Multi-Resolution Waveforms

INVENTOR: Urbain A. von der Embse

Clean version of how the Claims will read.

CLAIMS

WHAT IS CLAIMED IS:

Claim **1**. (currently amended) A method for designing multi-resolution waveforms and filters, said method comprising:
means fpr generating complex Wavelet waveforms and filters,
means for including a frequency translation property specified by
> a frequency translation parameter in addition to the
> scale and translation parameters,
means for using a subset of the Fourier harmonics as the design
> coordinates (harmonics) specifying the waveform design,
means for providing a single waveform design for all
> waveforms at multiple scales, translations, and
> frequencies, and
means for using the design harmonics and frequency translation
> property to generate Wavelet waveforms at multiple scales
> and multiple frequencies.

Claim **2**.(currently amended) The method of claim **1** further
comprising:
means for combining filter design requirements with Wavelet
> requirements to generate finite impulse response filters
> (FIR) and waveforms,
means for including frequency and time error metrics and for
> including application constraints in the weighted least-
> squares sum J of the error metrics,

means for finding the FIR design harmonics that minimize the
      constrained sum J of the error metrics,

means for implementing direct least-squares error techniques to
      find the design harmonics that minimize J,

means for implementing iterative eigenvalue error techniques to
      find the design harmonics that minimize J, and

means for using the plurality of design methodologies in the
      time-frequency space to find the design harmonics.

Claim **3**. (currently amended) The methods of claim **1** and claim **2**
further comprising:

means for designing polyphase orthogonal filter banks with
      almost perfect reconstruction properties,

means for designing polyphase quadrature mirror filter
      (QMF) orthogonal filter banks,

means for designing waveforms and filters with no excess
      bandwidth, and

means for designing almost ideal waveforms and filters for linear
      and non-linear applications.

Claim **4**. (currently amended) The methods of claim **1**, claim **2**,
and claim **3** further comprising:

means for including analytical, iterated filter bank, and
      scaling function design techniques for tiling (covering),

means for tiling the time-frequency space for
      communications and radar,

means for tiling the spatial-frequency space for media
      processing,

means for tiling the time-frequency-beam space for cellular and
      satellite communications and radar, and

means for tiling the time-wavelength space for laser and optical
      communications, targeting, and ranging.

Claim **5**. (currently amended) A method for the design of multi-resolution waveforms and filters, said method comprising:
means for generating complex waveforms with frequency translation, scaling, and time translation properties,
means for providing a single waveform design for all waveforms at multiple scales, translations, and frequencies,
means for using a subset of Fourier harmonics as the design coordinates specifying the waveform design,
means for using the design harmonics and the frequency translation property to generate waveforms at multiple scales and multiple frequencies, and
means for using the plurality of optimum design techniques to derive the design harmonics.

Claim **6**. (currently amended) The methods of claim **5** further comprising:
means for designing the multi-resolution waveforms for bandwidth efficient modulation (BEM),
means for designing the multi-resolution waveforms for high power amplifiers and non-linear signal processing,
means for designing the waveforms for non-linear applications,
means for designing the waveforms for multi-resolution and bandwidth-on-demand communications,
means for designing the multi-resolution waveforms for synthetic and real aperture radar applications, and
means for designing the multi-resolution waveforms for laser radar and laser communications.